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# NOTES ON THE LEPUSCULINA-LEPORINA SERIES OF APATELA

(Lepid., Phalaenidæ, Apatelinæ*)

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The notes in this paper are the result of identifications of specimens submitted from various sources.

The assistance of Messrs. K. Wyatt and Emil Beer is gratefully acknowledged. Both of these entomologists kindly donated aberrant specimens forming natural connecting links between several forms previously considered valid species, and the latter worker very kindly gave the author a series of specimens reared from a single caught female, as discussed in the text.

The problem was complicated by the type series of four of the names representing mixtures of species or varieties. Eleven specific names have been placed as synonyms, three names have been reduced to the status of mere colorational or maculational forms, five names have been reduced to subspecific rank, a European species has been eliminated from the North American fauna except as represented by indigenous subspecies with the consequent elevation to subspecific status of a name usually considered a synonym, and a single new subspecific name has been erected to rectify previous errors.

## APATELA LEPUSCULINA Gn.

1852. Guenée, Spec. Gén., I, 46, *Acronycta.*
1922. McDunnough, Can. Ent., LIV, 138-139, *Acronycta. populi* Riley.
1870. Riley, 2nd Rept. Ins. Mo., p. 119, ff. 87-88, *Acronycta. cretata* Sm. (partim. male nec female).
1897. Smith, Ent. News, VIII, 148, *Acronycta.*
1898. Smith & Dyar, Proc. U. S. N. M., XXI, 58, pl. XI, f. 3 (nec f. 4); pl. XVII, f. 15; pl. XIX, f. 18, *Acronycta. cinderella* Sm. (partim, male nec female).

*Noctuidæ, Acronyctinæ of authors.

1897. Smith, Ent. News, VIII, 149, *Acronycta.*
1898. Smith & Dyar, Proc. U. S. N. M., XXI, 64, pl. XI, f. 11, *Acronycta.*
*chionochroa* Hamps.
1909. Hampson, Cat. Lep. Phal. B. M., VIII, 136, pl. CXXVI, f. 13, *Acronycta.*
form *transversata* Sm.
1897. Smith, Ent. News, VIII, 149, *Acronycta.*
1898. Smith & Dyar, Proc. U. S. N. M., XXI, 65, pl. X, f. 10, *Acronycta.*
‡*cinderella* Sm. (partim. female nec male).
1897. Smith, Ent. News, VIII, 149, *Acronycta.*
1898. Smith & Dyar, Proc. U. S. N. M., XXI, 64, *Acronycta.*
form *canadensis* Smith & Dyar.
1898. Smith & Dyar, Proc. U. S. N. M., XXI, 57, *insita* var., (an sp. dist.?), *Acronycta.*
1904. Dod, Can. Ent., XXXVI, 353, *Acronycta.*
form *similana* Sm.
1905. Smith, Jour. N. Y. Ent. Soc., XIII, 190, *Acronycta.*
*tonitra* Sm.
1908. Smith, Jour. N. Y. Ent. Soc., XVI, 83, *Acronycta.*
subspecies *felina* Grt. (partim. male nec female).
1879. Grote, Bull. U. S. Geol. Geog. Surv., V, 208, *Apatela.*
1909. Hampson, Cat. Lep. Phal. B. M., VIII, 128, pl. CXXVI, f. 3, *Acronycta.*
1911. Smith, Ent. News, XXII, 311, *Acronycta.*
‡*lepusculina* Auct.
1888. Hy. Edwards, Ent. Am., III, 185, *Apatela.*
*frigida* Sm. (partim. male and female types, nec "co-types").
1897. Smith, Ent. News, VIII, 148, *Acronycta.*
1898. Smith & Dyar, Proc. U. S. N. M., XXI, 54, pl. XI, ff. 6 & 10, *Acronycta.*
1916. Barnes & McDunnough, Contrib. Nat. Hist. Lep. N. Am., III, (3), 165, pl. XIII, ff. 1-2, *Acronycta.*
*pacifica* Sm.
1897. Smith, Ent. News, VIII, 148, *Acronycta.*
1898. Smith & Dyar, Proc. U. S. N. M., XXI, 56, pl. XI, f. 5, *Acronycta.*
subspecies *cyanescens* Hamps.
1909. Hampson, Cat. Lep. Phal. B. M., VIII, 129, pl. XXVI, f. 5, *Acronycta.*
1911. Smith, Ent. News, XXII, 311, *Acronycta.*
‡*felina* Grt. (partim. female nec male).
1879. Grote, Bull, U. S. Geol. Geog. Surv., V, 208, *Apatela.*
1888. Hy. Edwards, Ent. Am., III, 185, *Apatela*
1897. Smith, Ent. News, VIII, 148, *Acronycta.*

1898. Smith & Dyar, Proc. U. S. N. M., XXI, 53, pl. XI, f. 9, *Acronycta.*
1904. Dyar, Proc. U. S. N. M., XXVII, 798-799, *Apatela.*
1916. Barnes & McDunnough, Contrib. Nat. Hist. Lep. N. Am., III, (3), 165-166, *felina, Acronycta.*
‡*frigida* Sm. (partim. "cotypes," nec types male and female).
1897. Smith, Ent. News, VIII, 148, *Acronycta.*
1898. Smith & Dyar, Proc. U. S. N. M., XXI, 54, *Acronycta.*
1911. Smith, Ent. News, XXI, 311, *Acronycta.*
1916. Barnes & McDunnough, Contrib. Nat. Hist. Lep. N. Am., III, (3), 165-166, *felina, Arconycta.*
*metra* Sm.
1911. Smith, Ent. News, XXII, 311, *Acronycta.*
1912. Barnes & McDunnough, Contrib. Nat. Hist. Lep. N. Am., I, (4), 39, pl. XVIII, ff. 1-2, *Acronycta.*
1916. Barnes & McDunnough, Contrib. Nat. Hist. Lep. N. Am., III, (3), 166, *felina* local form, *Acronycta.*
*turpis* Sm.
1911. Smith, Ent. News, XXII, 311, *Acronycta.*
1916. Barnes & McDunnough, Contrib. Nat. Hist. Lep. N. Am., III, (3), 166, *felina* local form, *Acronycta.*
*amicora* Sm.
1911. Smith, Ent. News, XXII, 312, *Acronycta.*
1916. Barnes & McDunnough, Contrib. Nat. Hist. Lep. N. Am., III, (3), 166, *felina* local form, *Acronycta.*

The names *populi* and *chionochroa* have already been sunk to *lepusculina*[1] by Dr. *McDunnough*[2]. The type of *populi* is in the National Museum. The name *chionochroa* is a nomen novem based on the *lepusculina* of the Smith and Dyar paper, so that the Smith specimens in the National Museum may be considered types.

McDunnough, however, goes further and considers *canadensis* as a dark western race; *cinderella*, with *transversata* as a probable synonym, as the name for the Colorado form, and comments on a white form[2] likely to be confused with *cretata*, which he treats as a race of *leporina*; the other forms discussed herein being omitted save for a casual reference to *frigida.*

In reality the male type of *cretata* is an extremely pale Colorado specimen of *lepusculina.* As Smith definitely split *cretata* from *leporina* on the basis of the genitalia and tarsi of

[1] The Barnes material contains a photograph of the type of *lepusculina* (Paris Museum) from M. Le Cerf through the kindness of Dr. McDunnough.
[2] 1922, Can. Ent., LIV, 138-139.

this male type, there seems nothing to do but to consider this specimen as the real type. Accordingly it is hereby designated the lectotype. Similar pale specimens are in the Museum collection from Aweme and Miniota, Manitoba; from Colorado; from Illinois; and from Pennsylvania. In view of the distribution, a separate name for these somewhat paler individuals seems of no significance.

The name *cinderella* is based on Colorado examples of *lepusculina*. Specimen for specimen these can be matched with normal eastern material, and the name seems to have no racial significance. The male type, hereby designated the lectotype, is a normal specimen. The female type shows the median shade of *transversata* well developed, and falls into that form.

The name *transversata* is based upon Colorado examples possessing a median shade. The form is more common in Colorado than in the East, but as the majority of Colorado specimens fall to *lepusculina* (*cinderella*), and as a specimen from New Brighton, Pa., is a good match for the types (male and female) of *transversata*, the name seems to have no significance except possibly as a minor maculational form.

The name *canadensis* is applicable to the powdery gray form, which is apparently more common in Alberta than elsewhere, but is duplicated by Illinois individuals and closely approximated by a specimen from Clearfield, Pa. In reality the form is simply an intermediate to the melanistic *similana*.

The names *similana* and *tonitra* are based on melanistic specimens, the latter name having little or no significance. All specimens seen by the author are from the region including Chicago, Ill., and St. Louis, Mo.

Through the kindness of Messrs E. Beer and K. Wyatt, the author was given a series of thirteen specimens of *lepusculina* forms bred by Mr. Beer from a single female *similana*. Eight specimens of this series are *similana* (*tonitra*), one specimen is *canadensis*, and the other four are intergrades between *canadensis* and *lepusculina*, superficially somewhat similar to western *felina* (*frigida=pacifica*) in appearance.

Grote described *felina* from a male in his own collection and a female loaned to him by Henry Edwards, citing the difference between the two types which is the difference between

the subspecies subsequently described as *frigida* (*pacifica*) and *cyanescens*. Hampson's figure (1909) agrees perfectly with Grote's description of the male type (=*frigida*); but not with the female type, in the Henry Edwards Collection[3], nor with the so-called type (presumably spurious) in the Tepper Collection[4]. The female type is the dull powdery gray form with indistinct lines figured by Barnes and McDunnough (1916). Hampson (1909) had not isolated any specimens under the names *frigida* or *pacifica* for the reason that he already had the name *felina* available. He recognized that *felina* (male type) was different from the dull gray form, and described the latter under the name *cyanescens*. Smith (1911) concurs with Hampson's action. To avoid further confusion the male type of *felina* in the British Museum is hereby designated the lectotype for the name.

The name *frigida* presents a rather complicated problem. The name is a misnomer as applied to the male and female types (from Alameda Co., Calif.; in the National Museum). Nevertheless these are the actual type specimens and must hold the name. Besides these types, Smith (1897) obviously had specimens of *cyanescens* (*felina* female nec male) included in his concept, hence the name *frigida*. Two of Smith's "cotypes" of *frigida* (1897) are in the material received with the Barnes Collection, are labeled Victoria, Vancouver, and are normal *cyanescens*. These were not included by Smith and Dyar (1898) under the name *frigida*, but the *frigida* of the latter date was also mixed with *cyanescens* according to Barnes and McDunnough (1916), and as shown by Smith under his description of *metra* (1911), the Rutgers College "cotype" of *frigida* being *cyanescens*.

The male type of *pacifica* (Henry Edwards Collection) is stated by Barnes and McDunnough (1916) to be identical with the National Museum types of *frigida*. The female type of *pacifica* is in the National Museum. It is the same form as the type of *frigida*. To avoid any chance of confusion this female type is hereby designated the lectotype for the name *pacifica*.

A long series of *felina* (*frigida*=*pacifica*) is before the au-

[3] A specimen compared by J. McDunnough and a second specimen compared by Wm. Barnes are in the U. S. National Museum Collection.

[4] A specimen compared by J. McDunnough is in the U. S. National Museum Collection.

thor from Mission San Jose and Irvington, Alameda Co., and from Eldridge, Sonoma Co., Calif., and no specimens have been seen which have definitely been labeled as originating in any other California locality. Individuals of this subspecies can easily be confused with individuals of *lepusculina*. No single character seems to be available for sorting. Nevertheless, the series as a unit appears relatively compact, the specimens being dull powdery gray and closely resembling aberrant *lepusculina* intermediate to form *canadensis*, but averaging somewhat smaller in size, with the transverse posterior line usually not quite so heavily marked, and the transverse anterior line with more of a tendency toward obsolescence. The frons seems very slightly more bulged on an average. The harpe is often somewhat shorter and broader, the clasper somewhat more twisted. But each of the above characters has been matched in some specimen of eastern *lepusculina*. The larvæ, according to two inflated specimens bearing the same Riley rearing number as the male and female types of *frigida*, are similar to those of *cyanescens*, differing from eastern *lepusculina* in the reduced length of the dorsal black hair pencils. These shorter black hairs are definitely tapered at the tips, and the shorter length is not the result of breakage. The subspecies, therefore, occupies the status of an existing intermediate between *lepusculina* and *cyanescens*.

With the names *felina*, *frigida*, and *pacifica* restricted to the subspecies of *lepusculina* which occurs in the vicinity of San Francisco, the name *cyanescens* becomes the first available name for the subspecies from the higher altitudes (*felina* female nec male; *frigida* cotypes nec types). The type male of *metra* was described from a Barnes Collection specimen, and accordingly was returned, as was the unique type female of *amicora* which obviously by its label was also loaned to Smith by Barnes. A specimen compared by Dr. Barnes with the unique type of *turpis* (Rutgers College) is before the author. The differences between the types are so obsolescent that one is constrained to wonder just why so many names were created. The slight differences which do exist between the Smith (1911) types are shown by a series from various localities to be individual variation caused by a few more or a few less black scales.

Upon casual examination *cyanescens* appears to be spe-

cifically distinct from *lepusculina*. The frons seem very slightly more bulged, the vestiture of the thorax with the scales somewhat narrower and more hairlike, in this latter character tending slightly toward *leporina*. The fore wing usually appears to be a little stronger and a little more pointed than in normal *lepusculina*. Nevertheless no character which appears to have any specific significance could be found in the genitalia. These organs in *cyanescens* tend to have the harpes somewhat shorter and wider, as an average, than the harpes of *lepusculina*, and the claspers tending to be somewhat more crooked. These characters are shown to be of little significance in a series of thirteen slides of *lepusculina* as contrasted with four slides of *cyanescens* and three slides of *felina*. The other structures of the male genitalia appear to be identical in the three subspecies, except the vinculum, which shows slight individual variation not restricted to any locality or form. The genitalic characters cited in the Smith and Dyar revision (1898) are based on slides which are before the author. These slides consist only of fragments of the genitalia, the harpes and claspers often broken or distorted, the fragments in all manner of positions. The differences illustrated in this revision between the so-called species herein included under *lepusculina* are largely a combination resultant of individual variation, differences in position of the corresponding parts on the respective slides, and distortion of the fragments.

The larva of *cyanescens* has been described by Dyar (1904) under the name *felina*, and a series of these same specimens are in the National Museum. Just how much the hair is curved like that of *leporina* (see Dyar, 1916) the author is unable to state. Only a single inflated larva shows any curvature to the hair, and that looks like the result of inflation. On the other hand possibly the hairs have straightened out owing to inflation of the larval skins. The dorsal black tufts are short, similar to those of *felina* (*frigida=pacifica*), subequal to the normal hair[5].

[5] Mr. Carl Heinrich has carefully studied the larvæ of *lepusculina* and *cyanescens*, and states that he cannot find any character to separate these except the shortened hair pencils of the latter. He could observe no differences in the setæ of the heads. Recently Mr. S. E. Crumb studied the same specimens of larvæ and was unable to find other differences.

The larvæ of all three subspecies presumably feed on the willow-poplar group of plants. The author has reared *lepusculina* on poplar; the *felina* and *cyanescens* larvæ in the Museum Collection are from willow.

Were it not for *felina* (*frigida*) the author might be inclined to consider *cyanescens* to be a valid species, with genitalia similar to those of *lepusculina*, and the larvæ differing mainly by the shortening of the black dorsal hair pencils. However with *felina* (*frigida*) having a larva like that of *cyanescens*, but so similar to aberrant *lepusculina* that no single character will serve to separate the adults, a single species is indicated.

### Apatela leporina L.

1758. Linnæus, Syst. Nat., Ed. X, p. 510, No. 79, *Phalena Noctua.*
subspecies *vulpina* Grt.
1883. Grote, Can. Ent., XV, 8, *Apatela.*
1904. Dyar, Proc. U. S. N. M., XXVII, 799, *leporina* race, *Apatela.*
*sancta* Hy. Edw.
1888. Hy. Edwards, Ent. Amer., III, 185, *populi* var., *Apatela.*
subspecies *cretatoides* Benj.
*cretata* Sm.(female nec male).
1897. Smith, Ent. News, VIII, 148, *Acronycta.*
1898. Smith & Dyar, Proc. U. S. N. M., XXI, 58, pl. XI, f. 4, (nec pl. XI, f. 3; pl. XVII, f. 15; pl. XIX, f. 18), *Acronycta.*
1904. Dod, Can. Ent., XXXVI, 353, *Acronycta.*
1904. Dyar, Proc. U. S. N. M., XXVII, 799, *leporina* race, *Apatela.*
1922. McDunnough, Can. Ent., LIV, 139, *Acronycta.*
subspecies *mœsta* Dyar.
1904. Dyar, Can. Ent., XXXVI, 29, *leporina* var., *Apatela.*
1904. Dyar, Proc. U. S. N. M., XXVII, 799, *leporina* race, *Apatela.*
subspecies *cassinoi* B. & Benj.
1926. Barnes & Benjamin, Can. Ent., LVIII, 309, (*leporina* race?), *Apatela.*

*A. leporina* is closely allied to *lepusculina.*

The last-stage larva of *leporina* lacks the black dorsal hair pencils of *lepusculina.* All larvæ of *leporina* seen by the author have pale heads which may be more or less heavily marked with dark brown or black, especially latero-cephalically and ventrally. All larvæ of *lepusculina* and any of its varieties seen by the author have black heads except for one of the two larvæ of *felina* (*frigida*), which has a dark rufous brown head[6]. Typically the larva of *leporina* tends to have the hair arranged in a whorl, while typically the hair is straighter in *lepusculina* (eastern specimens). Dyar, 1904, under the name *felina*, has

[6] Possibly inflated shortly after molting.

described the larva of *cyanescens* as having the hair arranged as in *leporina*[7].

The main superficial difference between adults of the two species is the more hairy thorax of *leporina* as contrasted with that of *lepusculina*, although each species has a characteristic habitus which is practically impossible to describe.

The genitalia of both species are very similar. The harpes and claspers of *leporina*, as in *lepusculina*, are individually variable in their exact shapes, both species closely approximating one another. The unci of both are variable individually in regard to exact width; but the uncus of *leporina* is only bulged distally, the mesial edge of the long hooked portion being slightly excurved; whereas the uncus of *lepusculina* is bulged both distally and mesially. The ridged plate of the ædœagus of *leporina* is approximately half as long as the ædœagus; whereas this plate in *lepusculina* is shorter and narrower, being slightly more than one-third the length of the ædœagus. These differentiating characters appear quite constant in twenty slides of *lepusculina* representing not only typical *lepusculina*, but the various color forms, and the subspecies *felina* and *cyanescens*; and in six slides of *leporina* representing not only typical *leporina* but the subspecies *vulpina*, *cretatoides*, *mœsta*, and *cassinoi*. The female genitalia are quite similar in the two species. A slight difference exists in the exact shape of the collars of the eighth segment, *lepusculina* having the mesiocephalic prolongations of this segment broader at their base than the same structures of *leporina*. The terminal segment of *lepusculina* is somewhat larger than that of *leporina*. These characters are solely of degree, and at least some variation is to be anticipated.

In North America *leporina* has a much more restricted distribution than *lepusculina*, being found in New York and New England, through Canada from Nova Scotia to Vancouver, extending southward in the mountains of Colorado and New Mexico. It is much less common than *lepusculina*, less subject to individual variation, but more productive of local and well marked racial forms.

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[7] See notes under the heading *lepusculina*.

The name *vulpina* is retained for the race of *leporina* found in the northeastern part of the United States and southeastern Canada. Specimens before the author are labeled N. Y., Mass., N. Hamp., and Nova Scotia.

Superficially in the male this race closely approaches the European *leporina* with a tendency for females to possess markings similar to those of *cretatoides* (*cretata* Sm. female nec male), as exemplified by a New York female identified "*cretata*" by Smith. The spines on the penis of all of the North American forms are not quite so long as those found in the single European male which was available for study.

The name *cretatoides* is applied to the Colorado race[8]. The female has been figured by Smith and Dyar (1898). The male is entirely similar to the female, differing markedly from *vulpina* by the black powderings, the emphasized maculation, and averaging considerably larger in size.

Two specimens from Ontario, six specimens from Manitoba, and one specimen from Vancouver seem to represent intermediates, connecting *vulpina*, *cretatoides*, and *mœsta*.

The name *mœsta* represents a darker powdery gray race from Kaslo, B. C. Dyar overemphasized the dark powdering in his original description by citing *mœsta* as being the color of *canadensis*. The type series is not much more heavily powdered with black than many normal specimens of eastern *lepusculina*, the black powdering being about as in *A. dactylina* Grote but with no brown tintings.

The name *cassinoi* is known to the author only by the unique male type. The maculation is more intensified than in the best marked specimens of *cretatoides*; the reniform elongated, practically joining the black spot on the costa; the basal dash not broken mesad of the transverse anterior line; the transverse posterior line distally strongly marked with black; heavy black powderings distal of this line and in the region below the cell; with a well marked tornal dash and with a heavy black line along the inner margin from the region of the transverse anterior line to the transverse posterior. Thus the form has gone beyond *cretatoides* in contrasts but is in part as heavily black powdered as the darkest *mœsta*.

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[8] See notes under *lepusculina*.

The genitalia of the type differ from all other *leporina* forms by having the ventral edge of the harpe nearly straight, forming with the dorsal edge the acute sides of a right-angled triangle. The character is probably purely individual, but is cited because it exists, and will demonstrate the variation in *leporina* which usually possess a rather lobate harpe.

**Apatela leporina cretatoides**, Benjamin, new subsp.

The characters have been cited in preceding paragraphs.

Expanse: Male, 43-45 mm.; female, 50-51 mm.

*Type localities and number and sex of types*: Holotype male, Glenwood Springs, Colo., July 24-30; allotype female, id., July 16-23 ("cotype" of "*cretata*"); three male paratypes, id., July 16-23, Aug. 16-23, and no date; one female paratype, Garfield Co., Colo., 7,000 ft., (Bruce) ("Type female" of "*cretata*"). Cat. No. 44328, U. S. N. M.

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## Notes on Ambrysus mormon Montd.

### (Hemiptera, Naucordiæ)

Although the members of the genus *Ambrysus* are naucorids usually associated with rapidly flowing streams, a very interesting species has been observed for the last two years in the waters of Clear Lake, Lake County, California. In this large inland lake the waters are not fast flowing and the adaptation of this insect to such waters is very interesting.

Toward the latter part of June nymphs and adults were collected among the lake weeds or more commonly by turning over rocks, whereupon they would dart quickly to the surface and then down again. They were found associated with several belostomids, dytiscids, numerous insect larvæ, a common amphipod, probably *Hyalella knickerbockeri*, a fresh water snail and a leech.

The species has been tentatively determined by Mr. R. L. Usinger as a variety of *Ambrysus mormon* Montd., to which it is closely related, but differs conspicuously by its uniform smaller size.—W. Harry Lange, Jr.

# CALIFORNIA APHIDIDÆ
## NEW CLOUDY-VEINED SPECIES

BY E. O. ESSIG

The generic position of certain cloudy-veined aphids, of which the familiar violet-infesting species described as *Rhopalosiphum violæ* by Pergande (1900) is an example, has been somewhat uncertain up to the present time. The recent discovery of two new species has necessitated an attempt to clear up the problem. Pergande's species has at various times been relegated to the genera *Neotoxoptera* (Theobald, 1915; Baker, 1920), *Fullawayella* (Baker, 1919), and *Idiopterus* (Hottes and Frison, 1931). The genus *Rhopalosiphum* lacks the prominent antennal tubercles. The genus *Fullawayella* was erected by Del Guercio (1911) for *Macrosiphum kirkaldyi* Fullaway (1910). In view of the fact that this species proved to be a synonym of *Idiopterus nephrolepidis* Davis (1909), which is monotypic, *Fullawayella* has no standing and must be discarded, which eliminates it from further consideration. Likewise *Neotoxoptera*, erected by Theobald (1915) for an aberrant form of what has proved to be the species described on violet by Pergande, must be discarded because it did not adequately characterize the species. Based as it was upon an unusual specimen in which the media vein of the fore wing had but a single branch, thus simulating *Toxoptera*, it cannot now be used for species in which this vein has two branches and must therefore be eliminated. This brings us to the genus *Micromyzus* van der Goot (1917) of which *M. nigrum* van der Goot is the type species. A study of the description and illustrations of this genus and species indicates that the species considered in this paper should be placed in *Micromyzus*. This genus is briefly characterized by having well-developed antennal tubercles, normal aphis-type wing venation, cloudy wing veins, rather long cornicles, which are swollen posteriorly and have distinct flanged openings, and a subcylindrical cauda somewhat constricted beyond the base. Named species which should fall in the genus are *Micromyzus nigrum* van der Goot and *M. violæ* Pergande (Fig. 1). To these should be added the new ones described in this paper.

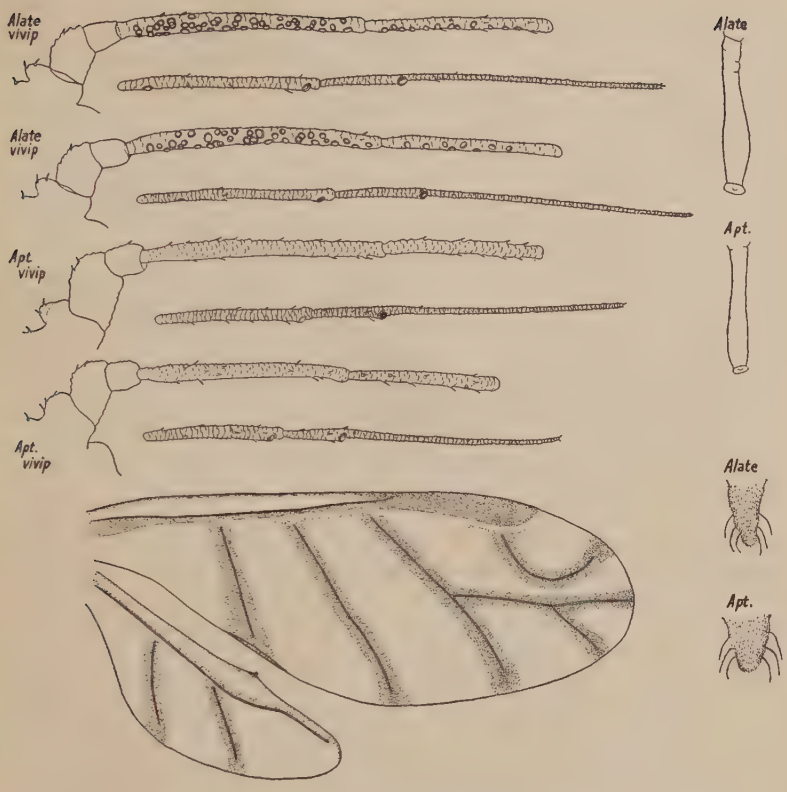


Fig. 1. The violet aphid, *Micromyzus violæ* (Pergande).

## The Onion Aphid

### Micromyzus alliumcepa, Essig, n. sp.

*Apterous viviparous female.* Medium-sized, somewhat robust and often broad and depressed dorsally. Color varying from deep magenta-red to almost black, the surface highly polished and shining. The antennal segments I, II, the apical portion of V, and all of VI, all of the femora, excepting the bases, the apices of the tibiæ, and the tarsi, are dusky or black. Length of body, of the larger specimens, 2.1 mm., width 1.2 mm. Antennæ arising from rather prominent frontal tubercles which are particularly noticeable in this form. Length of the segments: I, 0.11 mm.; II, 0.07

mm.; III, 0.55 mm.; IV, 0.35 mm.; V, 0.30 mm.; VI, base 0.15 mm., unguis 0.46 mm.; total 1.99 mm. Normal sensoria appear on segments V and VI as illustrated. Rostrum acute, extending to the second coxæ. Cornicles paler than the body in living forms; with wide base, constricted throughout the basal half, then gradually swelling beyond the middle, and again receding to the smallest diameter just before the flanged openings; length 0.35 mm., width 0.11 mm. Cauda narrowly conical in shape, with or without a slight constriction, and with three pairs of rather long incurved marginal hairs.

*Alate viviparous female.* Of average size and normal shape. Color very dark red with the head, antennæ, portions of the thorax, the coxæ, apices of the femora and tibiæ, and the tarsi dusky or black. Length 1.6 mm., width 0.7 mm. The inner margins of the prominent frontal tubercles and antennal segment I are gibbous and somewhat serrated. Antennæ longer than the body with many secondary circular and subcircular sensoria distributed as follows: III, 30-42; IV, 21-27 (rarely 5-10); V, 6-9 (usually 6); and the usual ones on VI. Lengths of the segments: I, 0.10 mm.; II, 0.10 mm.; III, 0.60 mm.; IV, 0.45 mm.; V, 0.35 mm.; VI, base 0.17 mm.; unguis 0.60 mm.; total 2.37 mm. Wings with normal aphis-type venation; veins all heavily clouded blackish. In the fore wings the radial sector (Rs) is variable in length and the amount of curvature, but it is usually semi-circular and closely approaches the media (M) as shown in Fig. 2. The veins are frequently modified in curious ways, which peculiarity appears quite characteristic of aphids with cloudy veins and probably accounts for the abnormality encountered by Theobald (1915) in his *Neotoxoptera violæ*. The cornicles and cauda are quite similar in form to those in the apteræ as shown in Fig. 2. The former are 0.30 mm. long and the latter 0.15 mm.

This species is closely related to *Micromyzus violæ* (Pergande) (Fig. 1) and *M. oliveri* Essig, n. sp. from which it is distinguished by the characters shown in the key at the end.

*Micromyzus alliumcepa* Essig is a distinct and interesting new species. It was first collected December 17, 1927, by the writer on some dry onion sets purchased from a Los Angeles seedsman for planting in the University of California greenhouse at Berkeley, California. Only apterous forms were present at that time and, although the infested onions were observed throughout the growing period, the aphid completely disappeared without reproduction. It was again observed by one of my students, S. J. Oliver, in a small backyard garden in Oakland, California, March 24, 1935, where leek plants were infested.

A number of alate and apterous females were collected at that time, but a second visit some weeks later failed to find a single surviving specimen. On April 1, 1935, the writer was fortunate enough to discover a third infestation in a small garden in Woodland, California, through the aid of W. D. Norton, Specialist in Agricultural Extension. Here the aphids fairly swarmed over a few onion plants which had almost succumbed to their attacks. These plants were grown from sets of unknown origin. The owner of the garden stated that some leek plants had already been killed in March and that chives were ruined by the same aphid during the previous season. Although many inquiries have been made concerning its distribution in California and in other parts of the country, no further information has been received, and its origin is still shrouded in obscurity.

The descriptions have been drawn from 163 specimens

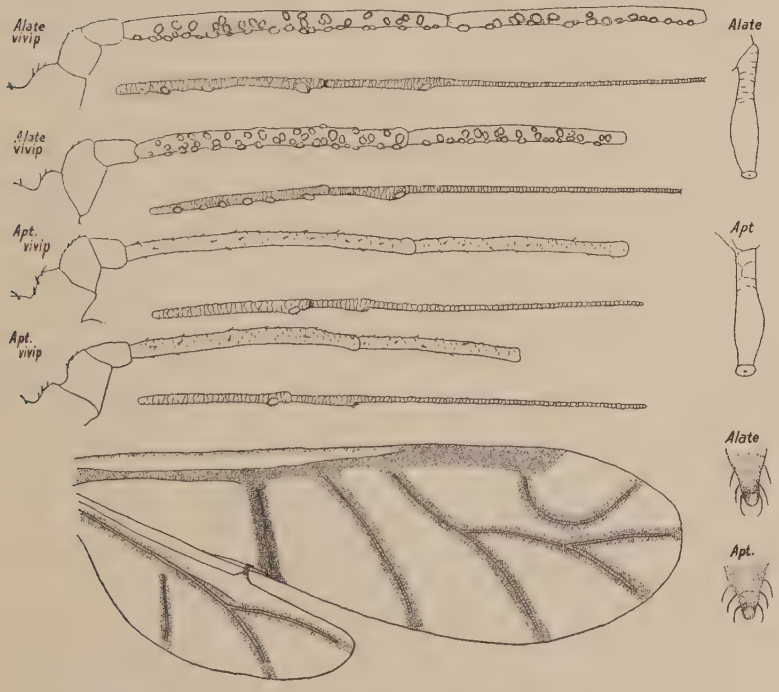


Fig. 2. The onion aphid, *Micromyzus alliumcepa* Essig, n. sp.

mounted on 29 slides designated as cotypes in the author's collection, and a number are in the collections of S. J. Oliver and other students.

### The Cloudy-veined Marigold Aphid

### Micromyzus oliveri, Essig, n. sp.

*Apterous viviparous female.* Rather more slender than the onion aphid, dark reddish, appearing black, somewhat shining or dull with portions of the antennæ legs, and cornicles pale. Length of body 1.90 mm., width 1.15 mm. Frontal tubercles prominent, gibbous, and roughened. The antennæ almost equal the body in length; pale excepting the base of segment V and all of I and VI, which are dusky. The usual permanent sensoria occur on V and VI. Segment I is gibbous and the entire surface roughened or serrated. Length of segments: I, 0.09 mm.; II, 0.06 mm.; III, 0.45 mm.; IV, 0.34 mm.; V, 0.28 mm.; VI base 0.14 mm., unguis 0.50 mm.; total 1.86 mm. Rostrum acute, terminal segment distinct, extending just beyond the 3rd coxæ. Cornicles pale, tips dusky in living forms; with wide base, constricted basally and swollen throughout the apical two-thirds; narrowing at apex and with flanged openings; length 0.27 mm. Cauda conical or somewhat triangular, slightly constricted just beyond the middle, marginal hairs rather inconspicous; length 0.10 mm.

*Alate viviparous female.* Shining dark-red appearing black in living forms; dark magenta in mounted specimens with black markings on the head, antennæ, thorax, legs, and abdomen. Length of body 2.01 mm., width 0.80 mm. Frontal tubercles prominent and gibbous. Antennæ just about as long as the body; dark throughout; segments I and II with roughened surface; III with from 15 to 21 secondary sensoria arranged mostly along the outer margin; IV occasionally with a single sensorium; V and VI with normal permanent sensoria only; length of segments: I, 0.10 mm.; II, 0.07 mm.; III, 0.50 mm.; IV, 0.36 mm.; V, 0.32 mm.; VI base, 0.15 mm.; unguis, 0.51 mm.; total, 2.01 mm. The dark markings on the dorsum and sides of the abdomen are quite characteristic of this species and appear distinctly in specimens cleared in KOH. The cornicles are similar

to those in the apteræ, the swelling being most prominent along the inner margins; length 0.26 mm. The cauda is much like that of the apteræ, length 0.11 mm.

This species was discovered by S. J. Oliver, for whom it is named, on the underside of the lower and older leaves of the common English, or pot marigold, *Calendula officinalis* Linn., growing in a small garden at Clovis, Fresno County, California, March 30, 1935. It has not been observed elsewhere. Its relation to *Micromyzus alliumcepa* Essig, n. sp. is shown in the key to species at the end of the paper.

Described from a series of 130 individuals mounted on slides and designated as cotypes in the author's collection. Other

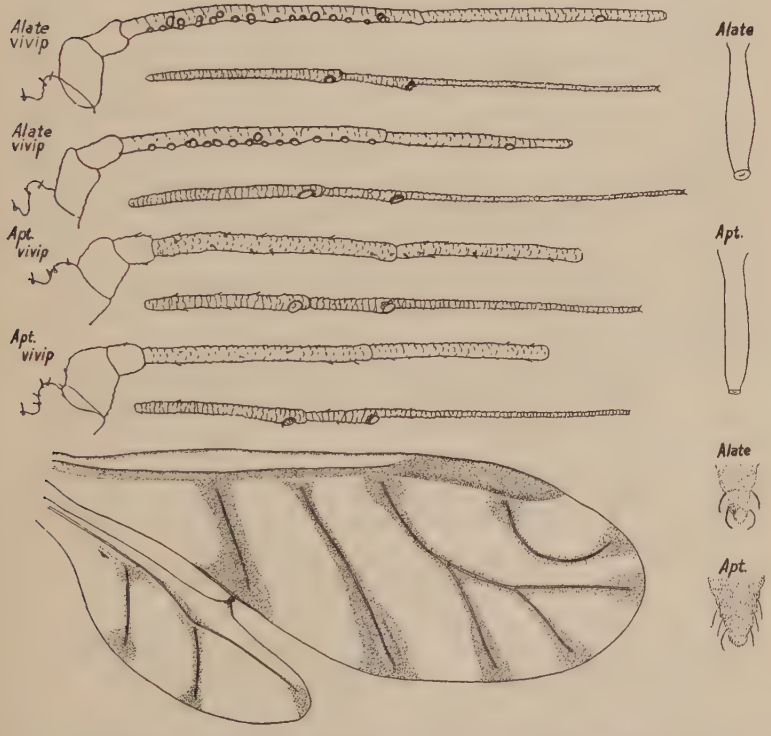


Fig. 3. The cloudy-veined marigold aphid, *Micromyzus oliveri* Essig, n. sp.

specimens of the same lot are to be found in several of the students' collections including that of Mr. Oliver.

## Key to California Species of Micromyzus

1. Antennal segment III with 15-21 subcircular and circular sensoria ..... *oliveri* n. sp.
... Antennal segment III with 30 or more (30-35) subcircular and circular sensoria ..... 2
2. Antennal segment IV with 8-12 and V with 1-2 subcircular and circular sensoria ..... *violæ* (Pergande)
... Antennal segment IV with 21-27 (rarely only 5-10) and V with 4-9 (usually 6) subcircular and circular sensoria ..... *alliumcepa* n. sp.

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# A LIST OF THE THYSANOPTERA OF CALIFORNIA

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The members of the order Thysanoptera of economic impotance have received in recent years an increasing amount of attention, and deservedly so. Hinds, Hood, Moulton, Steinweden, Watson, and others have made many and valuable contributions to the taxonomy of the thrips of North America. But, as a group, the thrips of California have received little notice.

In 1902, Hinds listed four species of Thysanoptera from California. Miss Daniel in 1904 added four more, Moulton recorded a total number of 25 species in 1907 and 45 in 1911. Watson, as late as 1923, cataloged only 54 species from this state. We are now able to total 107 species as having been taken in this important agricultural area.

This list has been compiled from published records, the files of the State Department of Agriculture, from suggestions by Mr. Dudley Moulton and Mr. J. B. Steinweden, and collections made by the author. Doubtless further collecting and study of the thrips in California will add materially to this record which it is hoped will establish a basis for later work

The taxonomic validity of *Aeolothrips longiceps* Crawford may be questioned and a thorough study of the systematics of this group may place more accurately such species as *Dactuliothrips spinosus* Moulton and *Mycterothrips longirostrum* (Jones). The species of economic importance are starred.

Sub-Order TEREBRANTIA Haliday, 1836
Super-Family AEOLOTHRIPOIDEA Hood, 1915
Family AEOLOTHRIPIDÆ Uzel, 1895

Sub-Family OROTHRIPINÆ Bagnall, 1913
Genus *Erythrothrips* Moulton, 1911

1. *E. arizonæ* Moulton, 1911.
2. *E. fasciculatus* Moulton, 1929.
3. *E. keeni* Moulton, 1929.

Genus *Orothrips* Moulton, 1907

4. *O. Kelloggi* Moulton, 1907.
5. *O. yosemitei* Moulton, 1911.
6. *O. variabilis* Moulton, 1927.

Sub-Family MELANTHRIPINÆ Bagnall, 1913

Genus *Ankothrips* Crawford, 1909

7. *A. robustus* Crawford, 1909.
8. *A. gracilis* Moulton, 1926.
9. *A. æqualis* Moulton, 1926.
10. *A. yuccæ* Moulton, 1926.

Sub-Family AEOLOTHRIPINÆ Bagnall, 1913

Genus *Aeolothrips* Haliday, 1836

11. *Ae. fasciatus* (Linn.), 1758.
12. *Ae. kuwanai* Moulton, 1907.
13. *Ae. longiceps* Crawford, 1909.
14. *Ae. nasturtii* Jones, 1912[1]
15. *Ae. tuolumnei,* Moulton, 1927.
16. *Ae. yosemitæ* Moulton, 1929.

Genus *Franklinothrips* Back, 1912

17. *F. vespiformis* (Crawford), 1909.

Family DACTULIOTHRIPIDÆ Moulton, 1931

Genus *Dactuliothrips* Moulton, 1931

18. *D. spinosus* Moulton, 1931

Super-Family THRIPOIDEA Hood, 1915
Family THRIPIDÆ Uzel, 1895
Sub-Family HELIOTHRIPINÆ Karny, 1921

Genus *Heliothrips* Haliday, 1836

*19. *H. hæmorrhoidalis* (Bouché), 1833.
20. *H. fasciapennis* Hinds, 1902.

Genus *Hercothrips* Hood, 1927

*21. *H. femoralis* (Reuter), 1891.
*22. *H. fasciatus* (Pergande), 1895.
23. *H. bromi* Moulton, 1927.
24. *H. gossypii* Moulton, 1927.

Genus *Parthenothrips* Uzel, 1895

*25. *P. dracænæ* (Heeger), 1854.

Sub-Family CHIROTHRIPINÆ Karny, 1921

[1] Mr. Moulton believes *tuolumnei* to be a synonym of *nasturtii.*

Genus *Chirothrips* Haliday, 1836

26. *C. similis* Bagnall, 1909.
27. *C. mexicanus* Crawford, 1909.

Genus *Limothrips* Haliday, 1836

28. *L. angulicornis* Jablonowski, 1894

Genus *Aptinothrips* Haliday, 1836

29. *A. rufus* (Gmelin), 1788.

Sub-Family Sericothripinæ Karny, 1921
Tribe Sericothripini Priesner, 1926

Genus *Sericothrips* Haliday, 1836

30. *S. variabilis* (Beach), 1896.
31. *S. albus* Jones, 1912.
32. *S. moultoni* Jones, 1912.

Genus *Scirtothrips* Shull, 1909

*33. *S. citri* (Moulton), 1909.
34. *S. longipennis* (Bagnall), 1909.
35. *S. albus* (Jones), 1912.
36. *S. aceri* Moulton, 1926.

Genus *Drepanothrips* Uzel, 1895

*37. *D. reuteri* Uzel, 1895.

Tribe Anaphothripini Priesner, 1926
Genus *Anaphothrips* Usel, 1895

38. *A. obscurus* (Müller), 1776.
39. *A. secticornis* (Trybom), 1896.
40. *A. zeæ* Moulton, 1911.

Sub-Genus *Odontanaphothrips* Moulton, 1926

41. *O. tricolor* Moulton, 1911.
42. *O. enceliæ* Moulton, 1926.

Sub-Genus *Neophysopus* Schmutz, 1913

43. *N. minutus* Moulton, 1929.

Sub-Genus *Prosopoanaphothrips* Moulton, 1926

44. *P. reticulatus* (Moulton), 1907.

Sub-Genus *Chætanaphothrips* Priesner, 1925

45. *C. orchidii* (Moulton), 1907.

Tribe DENDROTHRIPINI Priesner, 1926
Genus *Psilothrips* Hood, 1927

46. *P. priesneri* (Moulton), 1926.
47. *P. pardalotus* Hood, 1927.

Sub-Family THRIPINÆ Karny, 1921

Genus *Odontothrips* Amyot and Serville, 1843

48. *O. loti* (Haliday), 1852.

Genus *Scolothrips* Hinds, 1902

49. *S. sexmaculatus* (Pergande), 1894.

Genus *Frankliniella* Karny, 1910

*50. *F. occidentalis* (Pergande), 1895.
*51. *F. minuta* (Moulton), 1907.
52. *F. helianthi* (Moulton), 1911.
*53. *F. gossypii* (Morgan), 1913.
*54. *F. moultoni* Hood, 1914 (=*californicus* Moulton, 1911).

Genus *Tæniothrips* Amyot and Serville, 1843

*55. *T. inconsequens* (Uzel), 1895.
56. *T. ehrhorni* (Moulton), 1907.
57. *T. albus* (Moulton), 1911[2].
58. *T. costalis* (Jones), 1912.
59. *T. blacki* (Watson), 1919[3].
60. *T. tahoei* Moulton, 1927.
61. *T. albipennis* Moulton, 1929.
62. *T. vulgatissimus americanus* Moulton, 1929.
*63. *T. simplex* Morison, 1930 (=*gladioli* M. and S., 1931).

Genue *Arpediothrips* Hood, 1927

64. *A. mojave* Hood, 1927.

Genus *Rhopalandrothrips* Priesner, 1922

65. *R. corni* Moulton, 1927.

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[2] Mr. Moulton believes *costalis* to be synonymous with *albus*.
[3] Mr. Moulton believes this species to be a synonym of *frici* (Uzel), 1895.

Genus *Thrips* Linnæus, 1746

*66. *T. tabaci* Lindeman, 1888.
*67. *T. nigropilosus* Uzel, 1895.
68. *T. madroni* Moulton, 1907.
69. *T. bremneri* Moulton, 1907.
70. *T. magnus* Moulton, 1911.
71. *T. helianthi* Morgan, 1913.
72. *T. heraclei* Moulton, 1926.

Sub-Genus *Microcephalothrips* Bagnall, 1926

73. *M. abdominalis* Crawford, 1910.

Genus *Toxonothrips* Moulton, 1927

74. *gramineæ* Moulton, 1927.

Sub-Family MYCTEROTHRIPINÆ Karny, 1921
Genus *Mycterothrips* Trybom, 1912

75. *M. longirostrum* (Jones), 1912.

Sub-Order TUBULIFERA Haliday, 1836
Super-Family PHLOEOTHRIPOIDEA Hood, 1915
Family PHLOEOTHRIPIDÆ Uzel, 1895
Sub-Family PHLOEOTHRIPINÆ Karny, 1921
Tribe HOPLOTHRIPINI Priesner, 1927

Genus *Cryptothrips* Uzel, 1895

76. *C. rectangularis* Hood, 1908.
77. *C. sordidatus* Hood, 1927.

Genus *Cephalothrips* Uzel, 1895

78. *C. errans* Moulton, 1911.

Genus *Poecilothrips* Uzel, 1895

79. *P. ornatus* (Hood), 1913
80. *P. lupini* Moulton, 1929[4].
81. *P. dens* (Moulton), 1907.

Genus *Liothrips* Uzel, 1895

82. *L. ilex dumosa* (Moulton), 1907.
83. *L. varicornis* Hood, 1912.
*84. *L. vaneeckei* Priesner, 1920.
85. *L. corni* Moulton, 1926.
86. *L. xanthocerus* Hood, 1927.

[4] The writer has not seen this species but believes it to be synonymous with *P. ornatus*.

Genus *Rhynchothrips* Hood, 1912

*87. *R. ilex* (Moulton), 1907.

Genus *Hoplothrips* Amyot and Serville, 1843

88. *H. corticis* (DeGeer), 1773.

Genus *Priesneriella* Hood, 1927

89. *P. citricauda* Hood, 1927.

Tribe HAPLOTHRIPINI, Priesner, 1925

Genus *Haplothrips* Amyot and Serville, 1843

*90. *H. leucanthemi* (Schrank), 1781.
91. *H. fasciculatus* (Crawford), 1909.
92. *H. ruber* (Moulton), 1911.

Sub-Genus *Chonothrips* John, 1924

93. *C. gaviotæ* Moulton, 1929.

Sub-Genus *Zygothrips* (Uzel), 1895

94. *Z. californicus* Mason, 1926.

Genus *Neoheegeria* Schmutz, 1909

95. *N. verbasci* (Osborn), 1896.

Genue *Bagnalliella* Karny, 1920

96. *B. yuccæ* (Hinds), 1902.
97. *B. desertæ* Hood, 1927.
98. *B. mojave* Hood, 1927.

Genus *Karnyothrips* Watson, 1923

99. *K. flavipes* (Jones), 1912.

Genus *Leptothrips* Hood, 1909

100. *L. mali* (Fitch), 1856.
101. *L. heliomanes* Hood, 1927.

Tribe PHLOEOTHRIPINI Priesner, 1925
Genus *Phloeothrips* Haliday, 1836

Sub-Genus *Hoplandrothrips* (Hood), 1912

102. *H. armiger* (Jones), 1912. 103. *H. sycamorensis* Mason, 1926.

Sub-Family MEGATHRIPINÆ Priesner, 1927
Tribe MEGATHRIPINI Priesner, 1927

Genus *Megalothrips* Uzel, 1895

104. *M. hesperus* Moulton, 1907. 105. *M. picticornis* Hood, 1927.

Tribe COMPSOTHRIPINI Priesner, 1927

Genus *Formicothrips* Priesner, 1927

106. *F. yosemitæ* Moulton, 1929.

Super-Family UROTHRIPOIDEA Hood, 1915
Family UROTHRIPIDÆ Bagnall, 1909

Genus *Stephanothrips* Trybom, 1912

107. *S. bradleyi* Hood, 1927.

In addition to the above recorded species *Franklinella fusca* (Hinds), 1902, *Tæniothrips hawaiiensis* (Morgan), 1913, and *Haplothrips gowdeyi* (Franklin), 1908, have been intercepted at California plant quarantine inspection points.

Note: Since this manuscript was first submitted for publication (July 10, 1935), the author has been in correspondence with Professor J. D. Hood, Mr. Moulton, and Dr. H. Priesner and wishes to express his appreciation for their suggestions and corrections. Professor Hood believes that the genus *Psilothrips* should precede *Anaphothrips*, that *Pœcilothrips* should follow *Hoplandrothrips*, and has also generously offered other information from unpublished manuscripts and descriptions which it is to be regretted cannot be incorporated at this time.—S. F. B.

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### PHILEURUS ILLATUS LEC.

At Valley Wells, San Bernardino County, California, I took a specimen of *Phileurus illatus* Lec. at Light. Although Leng records this species as occuring in southern California it is exceedingly rare. In Arizona it is taken frequently—E. R. Leach.

# NEW CALIFORNIA THYSANOPTERA

BY DUDLEY MOULTON

This paper adds seven new species of Thysanoptera to the fauna of California. All of these except one are in the genus *Frankliniella* Karny. The common forms of this genus known here at the present time are: *occidentalis* Pergande (syn. *helianthi* Moulton), *moultoni* Hood (new name for *californica* Moulton), *minuta* Moulton and *gossypii* Morgan (found in Southern California and Arizona). The species *tritici* Fitch, so far as I know, has not been found in this state. The addition of six new species of *Frankliniella* therefore more than doubles the number which have been recognized here up to the present time.

## Frankliniella insignis, Moulton, n. sp.

Female holotype: uniformly light yellowish including legs and wings, antenna mostly yellow, with II a little darker, distal half of IV slightly clouded, outer half of VI and VII and VIII light brown. Spines light brownish yellow. Crescents of ocelli light yellow, concolorous with head or only a little darker.

Total body length 1.1 mm.; head length .08 mm., width .14 mm. Segments of antenna: III, 40 (20); IV, 36; V, 30; VI, 43; VII, 7; VIII, 9 microns. Length of spines: interocellar 40, postocular 16, on anterior angles of prothorax 56, on anterior margin 40, on posterior angles, outer 50, inner 66, on ninth abdominal segment, median 80, next adjoining 93, median on tenth segment 86. microns.

Pedicel of third antennal segment with distinct swelling in outer half; spines on fore wings: fore vein 17, hind vein 14; comb on eighth abdominal segment wanting.

Type material: female holotype taken on citrus foliage, in Southern California, May 10, 1929 (R. S. Woglum). In author's collection (No. 3841).

This species may be separated from *citri* Moulton by its shorter third antennal segment and the clear yellowish basal half of sixth antennal segment. It may be separated from *tritici* by these same characters and by the shorter terminal spines.

## Frankliniella citri, Moulton, n. sp.

Female holotype: Color; uniformly light yellowish including legs and wings, pterothorax slightly orange yellow; antennal segments: I, whitish yellow, II, brownish orange yellow, all of III,

basal half of IV and all of V clear yellow, outer half of IV and VI to VIII brown. Spines yellowish, only major spines brownish. Ocellar crescents light brownish orange.

Total body length 1.25 mm.; head length .102 mm.; width .147 mm. Segments of antenna: length (width) III, 50 (20); IV, 43; V, 33; VI, 43; VII, 10; VIII, 10. Length of spines: interocellar 46, postocular 20, on anterior angles of prothorax 60, on anterior margin 46, on posterior angles, outer 53, inner 73, on ninth abdominal segment, median, 86, next adjoining 93, median on tenth 93 microns.

Pedicel of third antennal segment with distinct swelling in outer half; spines on fore wing: fore vein, 19, hind vein, 16. Comb on eighth abdominal segment wanting in the middle.

Type material: female holotype taken on citrus foliage, October 9, 1926 (E. A. McGregor). In author's collection. No. 1155.

Type locality: Calexico, California.

This species may be separated from *tritici* Fitch by its clearer color, the longer antero-marginal and shorter terminal spines, 93 microns as compared with 116-126 in *tritici*.

### Frankliniella yuccæ, Moulton, n. sp.

Female holotype: head and thorax orange yellow, head lighter, pterothorax darker, abdomen brownish yellow, tenth segment darkest. First antennal segment grayish yellow, II and VI to VIII dark brown, III yellow in basal half shading to grayish brown in outer half, IV yellowish at base shading to dark brown in outer three-fourths, V yellowish in basal half, dark brown in outer half. Legs mostly yellow, femora shaded with brown on outer margins. Wings slightly tinted with yellow, veins yellow. Spines brown.

Total body length 1.32 mm.; head length .12 mm., width .17 mm. Segments of antenna: length (width) II, 43; III, 70 (22); IV, 66; V, 46; VI, 56; VII, 10; VIII, 16; total 340 microns. Length of spines: interocellar 63, postocular 36-40, on anterior angles, of prothorax 80, on anterior margin 83-86, on posterior angles, outer 96, inner 96, on ninth abdominal segment median 133, next adjoining 150, median on tenth 153 microns.

Pedicel of third antennal segment with only a slight swelling in outer half. Spines on fore wings: fore vein 22-23, hind vein 17-20. Comb on eight abdominal segment complete but weak in the center, with each seta arising from an enlarged saw-tooth-like base.

Male allotype colored as in female but lighter.

Type material: female holotype, male allotype, one male and

three female paratypes, taken in flowers of yucca in Southern California, May 15, 1926. (M. No. 701). Types in author's collection.

This species has a great resemblance to *occidentalis* Pergande but may be separated by the longer antennal segments and the longer spines.

### Frankliniella obscura, Moulton, n. sp.

Female holotype: Color blackish brown including antenna and legs, fore wings uniformly deep brown, spines blackish brown.

Total body length 1.06 mm. Segments of antenna: length (width); III, 50 (20); IV, 43; V, 36; VI, 46; VII, 10; VIII, 14. Length of spines: interocellar 40, postocular 30, on anterior angles of prothorax 66, on anterior margin 76, on posterior angles outer 76, median on ninth abdominal segment 106, next adjoining 126, median on tenth 106 microns.

Pedicel of third antennal segment with slight swelling. Spines on wings: fore vein 18, hind vein 14-15. Comb on eighth abdominal segment complete; each seta placed on a broadened saw-tooth-like base.

Male allotype smaller, head and legs brownish yellow, fore wings light brown. Clear, small oval areas on sternites two to six.

Type material: female holotype, male allotype and three female and two male paratypes taken in grass sweepings and on alfalfa. Types in author's collection. (M. No. 4861). Type locality, Ione, Amador County, Cal.

This species may be separated from *simplex* Priesner by its more uniformly deep brown color, shorter third antennal segment and lesser number of spines on hind vein of fore wing.

### Frankliniella venusta, Moulton, n. sp.

Female holotype: Head yellowish brown, lighter in anterior half, prothorax dark brown, pterothorax yellowish orange brown, darkened at the sides, abdomen blackish brown. Antenna: I, brown; II, dark brown; III to V, brownish yellow shading gradually to brown; VI to VIII, deep brown. Legs: fore tibiæ, tips of middle tibiæ and all tarsi rather clear yellow, the fore tibiæ shaded slightly at the sides, all femora dark brown, middle and hind tibiæ lighter at both ends. Wings clear, veins yellow.

Total body length 1.1 mm.; head length .10 mm., width .143 mm. Segments of antennæ: length (width) III, 43 (16); IV, 36; V, 33; VI, 43; VII, 7; VIII, 14 microns. Length of spines: interocellar 50, postocular 26, on anterior angles of prothorax 63,

on anterior margin 53, on posterior angles, outer 70, inner 76, median on ninth abdominal segment 106, next adjoining 116, median on tenth 106 microns.

Pedicel of third antennal segment with a slight swelling in outer half. Spines on wings: fore vein 17, hind vein 12. Comb on eighth abdominal segment complete but very sparse.

Type material: female holotype taken on California sage, July 31, 1926 at Markleeville, Alpine Co., California. (M. No. 961). In author's collection.

This species has the general appearance of *fusca* Hinds but is easily separated by the longer postocular and anterior marginal spines of the prothorax.

### Frankliniella conspicua, Moulton, n. sp.

Female holotype: Head and thorax brownish yellow, head lighter, pterothorax shaded with orange, abdomen brown, darker at tip. Antennal segments mostly brown, II darkest, III shaded with yellow in basal half. Legs brownish yellow, tibiæ mostly yellow, shaded at the sides. Wings uniformly light brownish, veins yellow. Spines brown.

Total body length 1.4 mm. Head length .117 mm., width .16 mm. Segments of antenna: length (width) II, 36; III, 50 (22); IV, 43; V, 36; VI, 50; VII, 10; VIII, 18 microns. Length of spines; interocellar 70, postocular 46, on anterior angles of prothorax 100, on anterior margin 90, on posterior angles outer 93, inner 100, median on ninth abdominal segment 126, next adjoining 146, median on tenth 153 microns.

Pedicel of third antennal segment simple. Spines on fore wings: fore vein 17, hind vein 13. Comb on eighth abdominal segment complete but weak.

Type material, female holotype taken on *Orthocarpus lacerus*, May 27, 1928. (H. Parker) (M. No. 2816). Type in author's collection.

Type locality, Lakeport, California.

This species has a close resemblance to *moultoni* Hood but is separated by the longer spines on head and prothorax and the lesser number of spines on hind vein of fore wing.

### Chirothrips secalis Moulton

Female holotype: Dark brown including antennæ and legs except third antennal segment which is lighter and all tarsi and distal portions of fore tibiæ which are yellow; wing brown.

Total body length 1.48 mm.; head length .10 mm., width .133 mm.; prothorax length .21 mm., width in front .143 mm., behind .233 mm.; antennal segments: length (width) I, 16 (26); II, 33 (26); III, 36 (23); IV, 40 (23); V, 33 (20); VI, 43 (20); VII, 10; VIII, 13; total length 230 microns. Spines on posterior angles of prothorax: inner 46, outer 56 microns; at top of abdomen 126 microns.

Type material: Female holotype and ten female paratypes taken on rye grass July 9, 1929 by G. R. Struble. Types in author's collection. (Moulton No. 3836).

Type locality: Willow Ranch, Modoc County, California.

This species is distinctive from other North American members of this genus in that the second antennal segment is simple and not drawn out into an angular process on the distal outer margin and in this respect it resembles *hamatus* Trybom found in Europe. The head is wider than long and not noticeably produced in front, the cheeks are slightly diverging posteriorly, with two pairs of minute setæ on forehead, the ocellar pair placed opposite anterior ocellus; the sense cone is simple on the third antennal segment and forked on the fourth. Side of thorax straight and diverging posteriorly, each posterior angle with two well developed spines and with three setæ on either side along posterior margin. Fore vein of fore wing with four basal spines and two near tip, hind vein with five near middle of wing and one at tip. End of abdomen drawn out and pointed much as in *similis* Bagn.

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## Note on Ptochiomera cæca Van D.

Mr. H. G. Barber has very kindly called my attention to the fact that the name *Ptiochiomera cæca* given by me to a species from the Marquesas Islands (Bishop Mus., Bull. 98, p. 187, 1932) is preoccupied by *Plociomera cæca* Distant from Guatamala. I do not find that a correction of this duplication has been published so I will now suggest the name **Ptiochiomera mumfordi** Van D., n. n., for this species.—E. P. Van Duzee.

# HOST INFLUENCE ON THE PROLIFICACY AND SIZE OF TRICHOGRAMMA

S. E. FLANDERS

*University of California Citrus Experiment Station*
*Riverside, California*

It has been noted by workers engaged in the mass production of *Trichogramma* that *T. evanescens* is more prolific than is *T. embryophagus*. This seems to be the case when *Sitotroga cerealello* Oliv. is used as a host. On the other hand Peterson (1931) states that, when reared on bag worm eggs, *embryophagus* is four times as prolific as *evanescens*. Schread and Garman (1933) conclude that *evanescens* is more prolific than *embryophagus* because it produces twice as many females per male as *embryophagus*, other factors being equal. Peterson, on the other hand, suggests that *embryophagus* is more prolific than *evanescens* because of its longer life.

Recently the writer investigated the development and morphology of both species of *Trichogramma* when reared in the eggs of *Estigmene acræa* (Drury). The eggs of this moth are of medium size and permit the complete development of from 1 to 10 individuals per host egg.

Several hundred *Estigmene* eggs were exposed to parasitism for periods of 1 to 60 minutes. This was done by isolating each host egg in a gelatin capsule with a single female, then removing the females that had oviposited as well as those in the act of oviposition.

One hundred eggs parasitized by *evanescens* produced an average of 4.3 adults per egg. Thirty eggs parasitized by *embryophagus* produced 5.4 adults per egg. In each case the sex ratio was 2 females to 1 male.

If *embryophagus* tends to deposit more eggs per host than does *evanescens* and other conditions are equal, it is obvious that on small hosts, such as *Sitotroga* which permit the complete development of only one or two individuals, *embryophagus* would be much less prolific than *evanescens*; and on larger hosts, such as the eggs of the bag worm, it would tend to be more prolific than *evanescens*. This relationship may account for the conflicting observations of the authors noted above.

In *Estigmene* eggs, one *evanescens* female may deposit at least three eggs without withdrawal of the ovipositor. The progeny of a mated female from a single *Estigmene* egg normally consists of two females and one male. If an ovipositing female is removed from a host egg after only one egg is deposited, the solitary offspring is invariably a female.

Effect of the Number of Eggs Deposited by Mated *Trichogramma evanescens* in *Estigmene* Eggs on Sex of Progeny

| Total number adults per egg | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Number of eggs with females only | 12 | 7 | 2 | 5 | 2 | 1 | -- | -- | -- | -- |
| Number of eggs with males and females | -- | 1 | 16 | 12 | 10 | 12 | 3 | 4 | 1 | 1 |

Solitary specimens from *Estigmene* eggs have a longer developmental period than do gregarious specimens. Presumably this is due to the necessity of the developing larvæ consuming an extraordinary amount of food in order that the interior of the host will be suitable for pupation. The abdomen of a solitary specimen is so enlarged that it emerges with great difficulty from the host. The head capsule and thorax reach their maximum size in such solitary specimens. This is indicated by the abnormal girth of the abdomen. The diameter of the exit aperture in the host, which is cut to permit the passage of the head and thorax, is too small to allow the abdomen to pass through readily. In some instances the parasite was unable to entirely emerge. This is particularly true of *evanescens*, which attains a maximum body length of 0.8 mm. The abdomen of *embryophagus* is somewhat narrower and the adults emerge with less difficulty. The maximum body length so far obtained in this species is 1 mm.

The eggs of *Estigmene* are uniform in size and content so that, if not superparasitized, the total mass of the parasites (1 to 10) developing in one egg is approximately equal to the total mass developing in another egg.

Large specimens of *Trichogramma* may be over five times as prolific as small specimens. A record of 200 parasitized *Sitotroga* eggs was obtained from one specimen of *evenescens*.

Under otherwise equal conditions, a difference in size of individual females results in their having different hosts. Large specimens of *Trichogramma* are able to oviposit in larger hosts than are small specimens. The eggs of *Pachysphinx modesta* (Harris) which have a chorion 28 microns in thickness are readily parasitized by the large specimens of *Trichogramma* but are immune to parasitism by small specimens. On the other hand, large specimens tend to ignore hosts of less volume than their own bodies. Solitary specimens from *Estigmene* eggs confined with *Sitotroga* eggs did not oviposit although their parents were reared from *Sitotroga* eggs.

The largest number of adults obtained from one *Pachysphinx* egg was 50, although the maximum number dissected from one egg was 75. When the largest possible number of progeny develop in a single host, they attain the minimum in size. The thick shell of the *Pachysphinx* egg is so resistant that in most cases the small parasites were unable to cut their way out.

## References

Peterson, A., Jour. Econ. Ent., 24:1070-1074, 1931.
Schread, J. C., and P. Garman, Conn. Agr. Exp. Sta., Bul. 353:691-756, 1933.

## A Note on Elasmostethus

In the Proceedings of the Entomological Society of Washington, xxxiv, p. 65, 1934, Mr. H. G. Barber sinks my *Acanthosoma cruciata cooleyi* as a synonym of *interstinctus* Linn. (syn. *dentatus* DeGeer). *Elasmostethus cooleyi* is actually a quite distinct species from either *cruciata* or *interstinctus*. My specimens of *dentatus* were received from M. Lethierry many years ago and were in good condition, having the brush of stiff bristles well developed. My statement in the original description of *cooleyi* that "in *dentatus* this sinus is indicated only by a small black tooth on either side" did not mean that this sinus was without the brush of stiff hairs as Mr. Barber seems to have interpreted it.—E. P. Van Duzee.

# BEES FROM COASTAL NORTHERN CALIFORNIA

BY CHARLES D. MICHENER

*Pasadena, California*

Prof. T. D. A. Cockerell, in a paper written at about the same time as this, has discussed numerous bees which he collected in the Redwood region, as well as some from the collections of the California Academy of Sciences. Those from the latter source not used by Cockerell were turned over to me, and this paper is based on studies of some of these specimens. It is to be hoped that eventually, as the bee fauna of the Redwood area becomes well known, some idea of the effect of the peculiar flora of this region upon the bees may be reached.

Thanks are due to Mr. E. P. Van Duzee for the loan of these specimens and for cooperation in matters of publication. I especially wish to express my thanks to Professor Cockerell for enabling me to study these bees, and for many helpful suggestions made throughout the preparation of this paper.

Types of the new species will be found in the collection of the California Academy of Sciences.

### Spinoliella anthidius (Fowler)

Male: Guerneville, Sonoma County, May 21, 1910, (Van Dyke).

The *Panurginus* described below are all forms which lack yellow markings in the males, as well as in the females. A key to these and other black-faced forms will be given in a forthcoming paper.

### Panurginus maritimus Michener, n. sp.

Male (type): Length 7 mm.; black, the apices of mandibles ferruginous; under side of flagellum pinkish brown beyond second joint, the first longer than second or third; mandibles not unusually long, that on one side reaching to the far side of the labrum (In *melanocephalus* Ckll. the mandibles are slightly shorter than this); eyes somewhat convergent below, the head much wider than long; wings very pale milky brown, the stigma pale brown, the first recurrent vein a little distad to first tranverse cubital; head and thorax faintly shining, mostly finely lineolate, with very few, very minute punctures, the posterior half of scutum more shiny than elsewhere and hardly lineolate; tegulæ shining black;

abdomen distinctly shining, faintly lineolate, impunctate; process of sixth sternite somewhat like *melanocephalus* Ckll. (see Crawford's figure of *morrisoni* Cwfd.) but not definately preapical; pubescence pale, that of clypeus fuscous mixed with black, that of front pale fuscous; clypeus practically punctureless, its emargination normal.

Point Reyes, Marin County, March 22, 1925 (H. H. Keifer).

Readily distinguished from other black-faced males by the color of the wings and antennæ.

### Panurginus emarginatus Michener, n. sp.

Male (type): Length about 5 mm.; black, rather slender; head much broader than long, the eyes converging below; mandibles slightly reddish at apices, about as long as in *melanocephalus*, a little shorter than in *maritimus*; first joint of flagellum considerably longer than second, a little longer than third; head and thorax slightly shining, very finely lineolate, most shiny on postscutellum, scutellum, and most of scutum; punctures very few and fine; abdomen quite shiny; wings nearly clear, the veins and stigma black, the first recurrent slightly basad to first transverse cubital; process of sixth sternite fairly broad, emarginate at apex, rather long, though not as long as in *atriceps* (Cress.); emargination of clypeus quite deep as usual; pubescence of head and thorax black, the front and dorsum of thorax with some pale hair, the venter of thorax with hair mostly pale; legs and abdomen with pale hair.

Female: Length 6 mm.; similar to male; clypeus with a few more punctures, but they are quite fine; pubescence of head and thorax mostly fuscous, with black on clypeus.

One of each sex from Meyers, 5 miles north of Miranda, Humboldt County, April 18, 1935, on *Ranunculus* (Van Duzee).

Smaller, with more shiny postscutellum than in the other black haired species, *nigrihirtus*. Mandibles shorter than in *nigrihirtus*.

### Panurginus nigrihirtus Michener, n. sp.

Male (type): Length about 6½ mm.; black; head much broader than long, the cheeks quite broad; eyes converging below; clypeus deeply and broadly emarginate, as usual; mandibles quite long, that on one side extending beyond opposite side of labrum, their apices often slightly rufescent; first joint of flagellum longer than second, usually a little longer than third; head and thorax slightly shining, distinctly lineolate, the median apical part of clypeus

more shiny than rest of clypeus, the postscutellum duller than scutellum, about as dull as enclosure of propodeum; posterior part of scutum not much if any shinier than anterior part; tegulæ shining black; abdomen shining, lineolate; punctures of head, especially clypeus and lower sides of face, rather large and numerous (for this group); scutum with some fine punctures; wings slightly dusky, the veins and stigma black, the first recurrent vein meeting or slightly basad to first transverse cubital; process of apex of sixth sternite broad, with a broad emargination after the manner of Crawford's figure of *rowheri* Cwfd. (*bakeri* Cwfd. not Ckll.); pubescence of head and thorax black, mixed with a little pale on scutum, replaced by pale on venter of thorax; mandibles, scape, legs, and abdomen with mostly pale hair.

Female: Length nearly 7 mm.; similar to male but face with more and coarser punctures; scutum not or hardly lineolate; pubescence paler, the clypeus with at least some black hairs, the rest of face and dorsum of thorax usually with fuscous hair.

Pubescence of male largely black as in *emarginatus*. See notes under *emarginatus* for distinctions between these species.

Meyers, 5 miles north of Miranda, Humboldt County, April 18, 1935, on *Ranunculus* (Van Duzee).

### Panurginus ceanothi Michener, n. sp.

Male (type): Length a little over 5.5 mm.; black, slender, form of *gracilis* Mich., head much broader than long, the eyes converging below; mandibles very long, rufescent at apices; head and thorax slightly shiny, faintly lineolate, the postscutellum as shiny as scutellum, the clypeus and sides of face with a few fine punctures, the scutum with still finer ones; abdomen quite shiny, slightly lineolate, with a few very fine punctures; process of sixth sternite fairly broad (wider than in *atriceps* (Cress.) and rather long, emarginate at apex after the manner of *nigrihirtus*; apex of clypeus with the usual large emargination; wings hardly dusky, the veins and stigma black; pubescence pale, fuscous on clypeus.

Yorkville, Mendocino County, May 8, 1935, on white *Ceanothus* (Van Duzee).

*Gracilis* Mich. (which will be published elsewhere), is the other pale-haired, small species with dark head, antennæ, and legs. It, however, has a very shallow emargination on clypeus.

### Panurginus nigrellus Crawford

Lagunitas, Marin County, March 29, 1908 (Van Dyke); Mark West Springs, April 23, 1935, on *Nemophila tricolor* (Van

Duzee). The above records are for males (many females also from Mark West Springs). Two females from Cazadero, April 13, 1918, (Van Duzee) are probably this species.

Female: Length usually not quite 7 mm.; similar to the male but punctures of clypeus usually slightly larger; pubescence (as in male) pale with black or fuscous on clypeus and sometimes on lower part of front.

PANURGINUS MELANOCEPHALUS Cockerell.

Fort Baker, Marin County, March 15, 1925 (C. L. Fox); Mill Valley, Marin County, March 15, 1925 (H. H. Keifer); Fairfax, April 13, 1919 (Van Duzee).

PANURGINUS OCCIDENTALIS (Crawford)

Males: Ben Bow Club, Humboldt County, April 19, 1935, on *Limnanthes douglasii* (Van Duzee, Coll.).

Female: Yorkville, Mendocino County, May 1, 1924 (Van Duzee).

**Halictoides californicus** Michener, n. sp.

Male (type): Length 5 mm.; bluegreen, the head blue, the clypeus, legs, antennæ, and sternites black (thorax obscurely, and tergites very obscurely, metallic); head much wider than long; eyes converging below; antennæ quite long, black, the flagellum with a row of hooked hairs for its entire length, the hairs small, and about eight or nine per joint; tegulæ black; legs normal except that the hind tarsi are flattened, joints two to four with rather long processes on one side; clypeus densely hairy, apparently with rather deep punctures except on the upper margin which is smooth and polished; enclosure of propodeum strongly striate; punctures fairly small, not close except on front; posterior margins of tergites broadly hyaline; pubescence fairly abundant, pale ochraceous on dorsum of head and thorax, white on face, not covering face except for clypeus; forming distinct abdominal bands, dull white on cheeks and sides of thorax; wings rather brown, the veins and stigma black, the second abscissa of cubital vein shorter than fourth.

Yorkville, Mendocino County, May 1, 1924, and May 8, 1935 (Van Duzee).

Not closely related to any described species. Differs from *davidsoni* Ckll. and *oryx* Vier. by shorter, more robust form, smaller size, etc. Differs from all other small green species

known to me by the arrangement of the hooked hairs of the antennæ.

HESPERAPIS PELLUCIDUS Cockerell

Male: Ben Lomand, Santa Cruz Mountains, May 16, 1931 (Van Dyke).

EMPHOROPSIS DEPRESSA (Fowler)

Females: Garberville, Humboldt County, April 19, 1935 (Van Duzee).

Male: Mount Diablo, April 24, 1935, on *Salvia mellifera* (Van Duzee).

**Anthophora simillima californiensis** Michener, n. var.

Male (type): Length about 15 mm.; similar to the typical *simillima* Cress. but pubescence much darker, the pale pubescence, particularly that of sides and front of thorax, ochraceous; hair of vertex entirely black, that of front and sides of face mixed with black; hair of cheeks dark fuscous or black; hair of legs black, mixed with dark fulvous on fore and middle tarsi; hair of under side of thorax and pleura up to the middle black; scutum with much black hair intermixed; pale hair of abdomen confined to first tergite and basal half of second.

Female: Similar to typical *simillima* but hair of head black, with a little ochraceous in front of ocelli; hair of legs, venter of thorax, and lower half of pleuræ black; hair of dorsum of thorax ochraceous with much black; abdomen without light hair beyond first tergite.

Two males and a female from Yorkville, Mendocino County, May 17, 1929 (Van Duzee).

A male from Mark West Springs (recorded by Cockerell), is much like the Rocky Mountain (typical) form, the last two tergites showing some pale hair, the pleura and venter of thorax pale haired, but pale hair mostly ochraceous, and femora and parts of tibiæ black haired. Until I saw this last specimen I thought *californiensis* was surely a good subspecies, if not a species. I can see no difference in genitalia between these two forms.

The female is superficially very similar to *A. ursina* Cress., differing by the mixture of black hair on the scutum, etc.

ANTHOPHORA URBANA Cresson

Females: Fairfax, Marin County, June 5, 1921 (C. L. Fox). Males: Cazadero, September 2, 1918 (Van Duzee).

ANTHOPORA ATERRIMA Cockerell

Females: Yorkville, Mendocina County, May 17, 1929 (Van Duzee).

ANTHOPHORA EDWARDSII Cresson

Male: Mount Diablo, April 24, 1935, on *Salvia mellifera* (Van Duzee).

ANTHOPHORA PACIFICA Cresson

Female (*A. ignava* Cress.); 4 miles north of Laytonville, April 19, 1935 (Van Duzee).

DIADASIA BITUBERCULATA (Cresson)

Males: Fairfax, Marin County, May 22, 1921 (C. L. Fox). Females: Mill Valley, Marin County, June 21, 1935 (Slevin).

DIADASIA NIGRIFRONS NEREA (Fowler)

Female: Guerneville, Sonoma County, May 31, 1910 (Van Dyke).

Osmia gracilis Michener, n. sp.

Female (type): Length nearly 6 mm. black, nonmetallic, the labrum, under side of flagellum, and parts of tegulæ dark brown; mandibles tridentate; maxillary palpi five jointed; apex of clypeus faintly emarginate in the middle; eyes converging below; facial line longer than transfacial; notauli linear; enclosure of propodeum somewhat rough but shining; head and thorax densely punctate, the punctures coarsest on clypeus; wings quite brown, the basal vein with a tendency to be beyond transverse median, the second abscissa of cubital vein slightly longer than fourth, the second submarginal cell much narrowed above (as in *exigua* Cress.); first tergite with a sulcus but no carina above it; abdomen with rather fine punctures; apical margin of fifth tergite reddish; pubescence dull white, sparse, nowhere covering surface; abdominal bands narrow, white, and broken (or worn off?) medianly; scopa dull white.

Mill Valley, Marin County, July 19, 1925 (Van Duzee). Runs to *Chelostoma minutum* Cwfd. or *Ashmeadiella coquilletti* Titus in Cockerell's key to California black *Osmias* (1935).

### Osmia abdominalis Michener, n. sp.

Male (type): Length 10 mm.; form rather long, the abdomen parellel-sided; head and thorax yellow green, somewhat brassy, with a small blue area around ocelli; abdomen brassy green, the fifth tergite with strong coppery tints, the posterior margins of the tergites broadly blue, these edged posteriorly with purple; apex of sixth tergite purplish black, brown laterally; tegulæ black, with a little green at the anterior ends; legs black, the fore and hind femora green; mandibles and antennæ black; pubescence white, reddish on under side of tarsi; head broad, the transfacial line distinctly longer than the facial; head and thorax finely and densely punctate throughout, the scutellum with a narrow polished line; wings faintly brownish, the basal vein meeting the transverse median, the second abscissa of cubital vein about twice as long as fourth; sixth tergite unnotched, but produced, the apex very obscurely truncated, the sides sinuate, producing fairly conspicuous obtuse angles near base; seventh tergite with its teeth broad, not pointed, and close together; posterior margin of second and third sternites about straight, untoothed; fourth sternite larger than any of the others, and produced apically.

One from Yorkville, Mendocino County, May 17, 1929 (Van Duzee).

Superficially this is somewhat similar to *physariæ* Ckll. which differs in many important structural characters, being an *Acanthosmoides*. *O. abdominalis* is really closest to *nemoris* Sandh., which is smaller and more robust, with the abdomen nearly all about the same color, the sides of sixth tergite less distinctly augulate, the second tergite larger than any of the others, etc.

### Osmia eutrichosa Cockerell

A male from Fairfax, Marin County, April 12, 1921 (C. L. Fox), agrees with the type except that the hair is quite red and the coloration is green. Both fore and hind femora are greenish in this specimen, as well as in the type.

### Osmia lignaria *Say*

Females: Fairfax, Marin County, April 12, 1928 (C. L. Fox); Yorkville, Mendocino County, May 8, 1935 (Van Duzee); Mill Valley, Marin County, April 19, 1928 (C. L. Fox); Cummings, Mendocino County, April 20, 1935, on *Ceanothus* (Van Duzee).

### Osmia gabrielis Cockerell

Female: Yorkville, Mendocino County, May 17, 1929 (Van Duzee).

# PROCEEDINGS OF THE PACIFIC COAST ENTOMOLOGICAL SOCIETY

NOTE: Following the policy adopted at the meeting of the Pacific Coast Entomological Society held on September 7, 1935, the minutes of that organization will henceforth be published in abstract form, omitting business transactions and items lacking in permanent interest to entomology.

One Hundred and Twenty-ninth Meeting, September 3, 1932.

Meeting held at 8 p. m. in the rooms of the California Department of Agriculture, Agriculture Building, San Francisco, California. Members present: G. F. Ferris, E. O. Essig, E. P. Van Duzee, E. R. Leach, G. R. Wilson, E. G. Linsley, R. L. Usinger, E. C. Zimmerman, H. E. Hinton, and J. O. Martin. President G. F. Ferris in the chair.

After the transaction of business, the President called upon various members for accounts of their summer's experiences.

Mr. Leach spoke of collecting in various parts of Nevada Co. where he was hindered by rain and cold weather. He reported collecting an example of *Platycerus oregonensis* which was of abnormal size and sculpture.

Mr. Van Duzee stated that he had spent part of April in the lower San Joaquin Valley and at Riverside but had also found collecting poor due to cold weather.

Mr. Linsley discussed his trip with Mr. Martin through Arizona and Texas. He spoke particularly of Brownsville, where collecting was extremely productive and interesting because of the subtropical conditions. He mentioned that this locality was particularly rich in Cerambycidæ, of which more than 33 per cent are typically subtropical species as compared with about 20 per cent for other large groups of Coleoptera.

Professor Essig described the flights of two broods of the California tortoise shell butterfly, *Aglais californica* (Bdv.), one of which migrated up the American River and the other down the same canyon. He also described severe bean crop damage in the San Joaquin Valley by the yellow-striped armyworm, *Prodenia præfica* Grote, which in certain areas destroyed 90 per cent of the crop.

Mr. Usinger spoke of collecting at Clear Lake and Lake Tahoe and discussed the experiments on the flight of drone bees which he had made at Davis, California.

Mr. Wilson gave an account of his work with the California State Quarantine Department and mentioned a shipment of silk oak logs from Australia which was found to be infested with between thirty-five and forty different species of insects representing several orders. He exhibited a box of these insects to the group.

Professor Ferris then presented a resumé of his nearly completed monograph of the sucking lice, of which he recognizes some 200 species in 35 genera. He stated that the genus *Pediculus*, according to his studies, contains only three recognizable species and that the head and body louse of man exhibited no specific differences. He also mentioned that the majority of species of lice are found on rodents, and that the carnivores, with the exception of seals and sea lions, have none.

After Professor Ferris' paper was concluded the meeting adjourned.

J. O. Martin, Secretary.

One Hundred and Thirtieth Meeting, December 3, 1932.

Meeting held at 2 p. m. in Room 112 Agriculture Hall, University of California, Berkeley, California. Members present: G. F. Ferris, E. O. Essig, J. O. Martin, E. P. Van Duzee, R. M. Blackwelder, E. G. Linsley, H. E. Burke, R. W. Doane, W. B. Herms, G. R. Wilson, R. L. Usinger, G. R. Struble, E. C. Zimmerman, R. F. Sternitsky. Visitors present: W. M. Hoskins, F. D. Klyver, H. Jefts, J. A. Elson, A. E. Michelbacher, J. L. Gressitt, J. F. Lamiman, C. R. Bruck.

Mr. J. L. Gressitt was unanimously elected to membership in the society.

Professor Ferris turned the meeting over to Professor Herms, who gave an outline of the various activities of the entomological department of the University, after which he conducted the groups through the entomological laboratories, explaining the work in progress and introducing the various staff members. After the inspection, refreshments were served and the meeting adjourned.

J. O. Martin, Secretary.

One Hundred and Thirty-first Meeting, March 4, 1933.

Meeting held in the entomological laboratories of the California Academy of Sciences, San Francisco, California. Members present: L. I. Hewes, J. B. Steinweden, R. L. Usinger, G. R. Wilson, R. E. Blackwelder, E. G. Linsley, F. E. Blaisdell, A. R. Mead, E. O. Essig, H. E. Hinton, J. F. Killeen, L. R. Killeen, J. L. Gressitt, E. P. Van Duzee, R. W. Doane, I. McCracken, E. R. Leach. Visitors present: B. Walker, W. H. Lange, R. L. Furniss.

Messrs. Walker, Lange, and Furniss were unanimously elected to membership.

Mr. Van Duzee presented an account of the collections of the Department of Entomology in the California Academy of Sciences. He stated that there had been only four curators in seventy-one years. The present collection began with three hundred types which were saved from the 1906 fire. In 1916 the collection consisted of only about thirty thousand insects but at the present time contains over nine hundred thousand specimens.

Professor Essig discussed the insect collections of the University of California. He said that Dr. Hilgard was the first one interested in entomology. The collection of Dr. Rivers was the first purchased by the University but this later disappeared. The same was true of the Ricksecker collection which was subsequently obtained. Another early collection was that of Linnean species which was formed by Mr. Charles Fuchs and which is still preserved. The present University collection is largely a working collection, type material having been deposited in the Academy of Sciences.

Dr. Killeen spoke of some of the early collections made along the Mexican border between 1849 and 1852, and Dr. Blaisdell discussed some of the early California entomologists.

Professor Ferris introduced the subject of microscope slide collections and described his method of filing slides in envelopes.

After a discussion of methods of preserving soft-bodied insects and the use of alcohol and gelatin as preserving media, the meeting adjourned.

E. R. Leach, Secretary pro tem.

One Hundred and Thirty-second Meeting, April 9, 1933.

Annual field meeting, held in the hills west of Stanford University, Palo Alto, California. Members present: G. F. Ferris, G. R. Wilson, E. P. Van Duzee, M. Doudoroff, J. B. Steinweden, J. L. Gressitt. Visitors: Mrs. E. P. Van Duzee, Mrs. C. R. Hubbs, Mrs. J. B. Steinweden, Mrs. G. R. Wilson and family, Miss M. Gottlund, P. C. Ting, F. H. Sumner, H. E. Howard.

Members met at Jordon Hall and then proceeded to the nearby hills. The day was spent in collecting and picnicking, but no unusual captures were reported.

J. O. Martin, Secretary.

One Hundred and Thirty-third Meeting, September 16, 1933

Meeting held at 2 p. m. in the entomological laboratories of the California Academy of Sciences, San Francisco, California. Members present: E. O. Essig, H. E. Burke, E. C. Van Dyke, E. R. Leach, E. P. Van Duzee, E. G. Linsley, R. L. Usinger, E. C. Zimmerman, R. E. Blackwelder, J. L. Gressitt, H. E. Hinton, and J. O. Martin. Visitors present: M. F. Blair, J. Blum, A. R. Mead, and A. Long. Vice-president Essig in the chair.

After the transaction of business matters, the nominating committee consisting of Dr. Van Dyke, Mr. Van Duzee, and Mr. Leach, proposed the following as officers for the coming year: for President, Professor Essig; for Vice-president, Dr. H. E. Burke; and for Secretary-Treasurer, Mr. J. O. Martin. The group was unanimously elected by the Society.

Dr. E. C. Van Dyke gave an account of his recent visit to the various entomological collections of Europe, including those at

London, Brussels, Berlin, and Prague. He spoke particularly of the means of housing the collections and the method of mounting specimens in comparison with methods followed in this country.

Mr. H. E. Hinton related his traveling experiences on a hitch-hiking trip to Mexico made by himself and Mr. Usinger for the purpose of collecting insects. He was followed by Mr. Usinger, who supplemented Mr. Hinton's remarks with a discussion of collecting conditions and the entomological results of their trip. He stated that most of their collecting had been done in the District of Temescaltepec in the State of Mexico and that their combined collecting would add a great many new species to the known Mexican fauna.

After considerable discussion and questioning of Mr. Usinger, the meeting adjourned.

J. O. Martin, Secretary.

One Hundred and Thirty-fourth Meeting, December 2, 1933.

Meeting held at 2 p. m. in the entomological laboratories of the California Academy of Sciences, San Francisco, California. Members present: E. O. Essig, E. C. Van Dyke, H. E. Burke, E. P. Van Duzee, C. C. Riedy, E. R. Leach, D. Moulton, R. W. Doane, E. G. Linsley, E. C. Zimmerman, A. R. Mead, R. L. Furniss, J. B. Steinweden, H. E. Hinton, G. R. Wilson, R. F. Sternitsky, H. H. Keifer, J. L. Gressitt, R. E. Blackwelder, P. C. Ting, T. Davis, R. L. Usinger, and J. O. Martin. Visitors present: W. Nutting, J. Blum, K. A. Salman, A. E. Michelbacher, C. D. Duncan. President Essig in the chair.

After the transaction of business, Mr. A. E. Michelbacher, Dr. K. A. Salman, and Mr. P. C. Ting were elected to membership in the Society.

Dr Van Dyke read a report upon the death of one of the Society's charter members, Mr. J. G. Grundel, and by unanimous vote of the group it was decided to incorporate the report in the minutes.*

Mr. Charles Riedy, also a charter member, made a few appropriate remarks following Dr. Van Dyke's report, and exhibited a postal card on which the notice of the first meeting had been sent. The card, dating back forty-two years, was passed around and created considerable interest.

Mr. Dudley Moulton spoke of some of his recent work on the Thysanoptera of South America and exhibited three of his papers which had recently been published in Sao Paulo. Mr. Moulton also discussed the final disposition of his very complete collection of Thysanoptera of the world.

Professor Essig then introduced the subject of entomological literature and stated that in the combined libraries of the Uni-

*This report was published in the Pan-Pacific Entom., Vol. X, p. 48, 1934.

versity of California, Californa Academy of Sciences, and Stanford University, as complete a collection of entomological books could be found as anywhere in the country. He then exhibited some rare old books from his own personal library including an original of De Geer.

Mr. Van Duzee followed with interesting comments and likewise exhibited old and rare items from his personal library.

Dr. Van Dyke pointed out the necessity of preserving the original bindings on such books and stated that these were frequently necessary to determine the date of publication.

After a general discussion of entomological books the meeting adjourned.—J. O. Martin, Secretary.

One Hundred and Thirty-fifth Meeting, March 3, 1934.

Meeting held at 2 p. m. in the entomological laboratories of the California Academy of Sciences, San Francisco, California. Members present: E. O. Essig, E. C. Van Dyke, E. P. Van Duzee, R. E. Blackwelder, L. W. Saylor, C. C. Riedy, H. E. Burke, A. Mead, J. Blum, E. G. Linsley, G. R. Wilson, H. H. Keifer, R. W. Doane, R. L. Usinger, K. A. Salman, A. E. Michelbacher, G. R. Struble, C. D. Duncan, P. C. Ting, H. E. Hinton. Visitors present: B. J. Hall, R. M Fouts, D. DeLeon, R. L. Furniss, L. D. Cristenson, E. W. Jones, J. M. Miller, S. E. Flanders, J. C. Lindahl, J. Bongberg, and F. R Platt. President Essig in the chair.

Mr. E. W. Jones was unanimously elected to membership in the Society.

After the transaction of business it was decided that the Pacific Coast Entomological Society would act as host to other entomological societies meeting in connection with the American Association for the Advancement of Sciences at Berkeley, in June.

Mr. Hartford Keifer presented a paper entitled "The Value of Practical Insect Classification in Insect Control." Mr. Keifer reviewed the facilities available to the economic entomologist for the identification of insects and made many practical suggestions for increasing their usefulness.

Dr. H. E. Burke presented a review of his work with the Division of Forest Insects of the United States Department of Agriculture. Dr. Burke discussed knowledge of insecticides, control, and life-histories in 1900 and outlined the organization of the Division under Dr. Hopkins. He then followed with an account of some of the more important problems which had been worked out during the thirty-two years of his association with the Department. At the conclusion of his discussion, he exhibited numerous drawings illustrating life-histories and stages of important forest insects.

Following Dr. Burke's paper there was considerable discussion of color of insects and of methods of preserving larvæ. The meeting then adjourned.—E. G. Linsley, Secretary pro tem.

# NOTES ON SOME CALIFORNIA BUTTERFLIES

BY WM. HOVANITZ

*Berkeley, California*

## Æneis chryxus Dbldy. & Hew.

This typically Rocky Mountain species was taken for the first time in California at a little over 9000 feet on Sonora Pass, Alpine County, California, July 17, 1935. Some speculation may be involved as to why this species has been found in such an isolated colony, but when one compares *chryxus* with *ivallda* Mead, found in like situations in other parts of the Sierra, it is easy to see a close relationship between the two. *Ivallda* seems to be only a pale race of *chryxus* with undoubtedly other minor changes (Barnes and Benjamin list it as such). This Sierran *chryxus*, though, differs from the Rocky Mountain form in that there is a bold contrast between the colors. Very few individuals have the dull merged colors of the typical *chryxus* although there are some of the latter with bold markings. How constant this is will have to be determined. This same situation is also true of *Neominois ridingsii* Edw., which some years ago was found to fly at high elevations in the Southern Sierra. California specimens have the dark colors boldly contrasted with the white, the ocelli are larger and the white band on the upper side of the secondaries is continuous, in Rocky Mountain specimens it is usually broken by dark colored veins.

Although the range of both *ridingsii* and *chryxus* in California may be somewhat greater than now supposed, it is hoped that too heavy collecting upon these grounds will not take place as the races should not be exterminated. In late years the fad of series collecting has caused the wiping out of many large colonies of rare butterflies, in fact, I know of collectors obtaining as many as five hundred specimens at the same place within a few days. It is true that one must obtain a large series in order to show the variations in the species, but they need not be all taken at the same place at the same time. An interval of a few seasons would allow the colony to recuperate. *Chryxus*, especially, must have a very limited range as the area around there has been collected for many years but the butterfly had

never been found. Maybe some day the government will take a hand in the protection of these beautiful things as it does with the birds and flowers.

EURYMUS ALEXANDRA EDWARDSII FORM ♀ HATUI B. AND B.

This is the albino female of the typical *edwardsii*. One specimen was taken in a creek bed near Likely, Modoc County, California, along with other typical yellow specimens. The albino probably has never been taken in California before.

BREPHIDIUM EXILIE SCUD.

This tiny butterfly, which, in California, has been thought to be found only in the southern part of the state seems to have a much wider distribution. I have taken several specimens along the desert roads in Lassen County, near Litchfield, and throughout the sage lands of the plateaus of eastern Lassen and Modoc counties. It may have been introduced and seems to be quite common. It has also been taken or seen at times in gardens throughout the San Francisco Bay District, and Mr. R. Bohart records it at an elevation of 10,600 feet on Mt. Conness in Tuolumne County, California, so it undoubtedly has a much larger range than was formerly supposed.

EUPHYDRYAS BARONI EDW. AND E. EDITHA BDV.

Some controversy has been going on as to what the specimens found around San Francisco Bay, belonging to this group, are. If one will notice that the type locality of *baroni* is Mendocino County and of *editha* is the southern Coast Range or the Sierra Nevada (probably Kern County), it will no doubt occur to him that San Francisco is quite far from either of these places. We might expect San Francisco specimens to be intermediate in character, and by comparison with specimens from the type localities, this is shown to be the fact. The San Francisco form is not deserving of a name so it will have to go by the one that seems to fit the individual insect the best. If simple facts such as this will only be used by our Lepidopterists, much confusion and disorder would be avoided. One fact that many seem to overlook is that a single species may vary throughout its geographical range. This is, of course, very generally accepted by scientists for it is a basis for the evolution of species. Especially is this true in the west where our species are in a plastic state.

There are many influences which effect these geographical forms and account in part for their distribution. (1) genetical change instituted by some climatic factor, (2) pure mendelism, (3) physiological changes caused by climate or host, (4) mutation, (5) the persistance of a species in a remnant of a flora which may have had a much wider range than it has today. An example of the latter is *Parnassius clodius* in Marin County, California, where, as a species quite separated from its usual range, it is still surviving in connection with a localiized flora which is a direct descendant of a Miocene forest.—(Carnegie Inst. Bull. 415).

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## A New Work on Shade Tree Insects

Herrick, Glenn W., Insect Enemies of Shade Trees. Comstock Publishing Company, Inc., Ithaca, N. Y., 1935. Price $5.00.

This is a beautifully printed octavo volume of 417 pages, illustrated by one plate and 321 text figures. There is an interesting chapter on the value of shade trees, one on materials for control of insects and one on the treatment of weakened trees. These are followed by 27 chapters on the insect enemies of the more popular shade trees. Under each tree is an account of its principal insect enemies, including a description of the injury they inflict, their life history and control, and in most cases one or more excellent cuts serve to identify the pest. We notice that Dr. Herrick has adopted the common but erroneous use of the term Hemiptera in place of Heteroptera. The former name having been established by Linnæus to include both the Heteroptera and Homoptera, there is no justification for confining the name to one of the suborders founded later by Latreille.

While treating mostly of eastern species our western insect pests have not been neglected. The book can be heartily recommended for the use of those having the care of shade trees.—E. P. Van Duzee.

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